Spectrometer for Particle Characterization With a New Multiple-Scattering Theory, Phase I

Completed Technology Project (2005 - 2005)

Project Introduction

There are two major commercial types of light-scattering particle size analyzers: Static Light Scattering and Dynamic Light Scattering. They are expensive, delicate, bulky, and must operate at extremely low particle concentrations. A fundamental mathematical model for high concentrations has been in need for decades and finally developed by the author after 25 years of research and development (METAMODEL

TM

). UV-NIR spectroscopy has a long successful history for molecular characterization of gases, liquids, or solids but commercial particle size analyzers based on this powerful principle do not exit. Seven impediments for its presence in the market are identified and their resolution either described as already accomplished by the author or achievable with a high probability of success during Phase I. It is our long-term goal to develop a commercial UV-NIR high dynamic-range, miniaturized, robust spectrometer for particle size analysis in the range 1 nm to 10 um (METASIZER

TM

). During Phase I, a breadboard prototype to demonstrate feasibility will be developed. We firmly believe that, due to its expected superior performance and lower cost, our innovation and its derivatives could revolutionize the field of particle sizing in both diluted and concentrated particulates. Applications are innumerable ranging from materials science through pharmaceuticals to environmental.

Anticipated Benefits

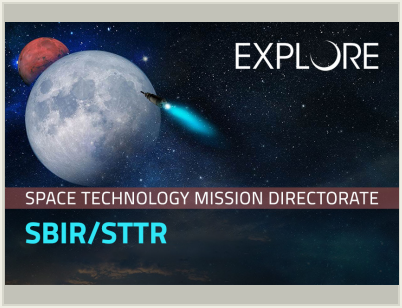
* Pharmaceutical * Nano-Composites * Nano-Medicine * Food and Beverages * Materials Science * Polymers * Mineral Processing * Chemical * Ceramic * Paper * Pigments and Coatings * Cement * Petrochemical * Semiconductor * Bio-Colloids * Environmental * Cosmetics * Colloidal engineering in Space. Highly concentrated colloids could be studied without sedimentation with our METAMODEL

TM

theory predicting multiple-scattering effects; * Aerosol characterization (AERONET, MPLNET, Mars Network); * Joint atmospheric chemical identification and determination of aerosol particle size distribution and concentration (PSD/Cv); * Joint biogenic identification and PSD/Cv determination; * Characterization of jet engine emissions like the Nanometer Aerosol Size Analyzer developed at NASA Langley but with a much broader size range; * Droplet size characterization of jet fuel sprays with high Cv where multiple-scattering is non-negligible so METAMODEL

TM

is again uniquely positioned; * Characterization of metal powders (rocket



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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

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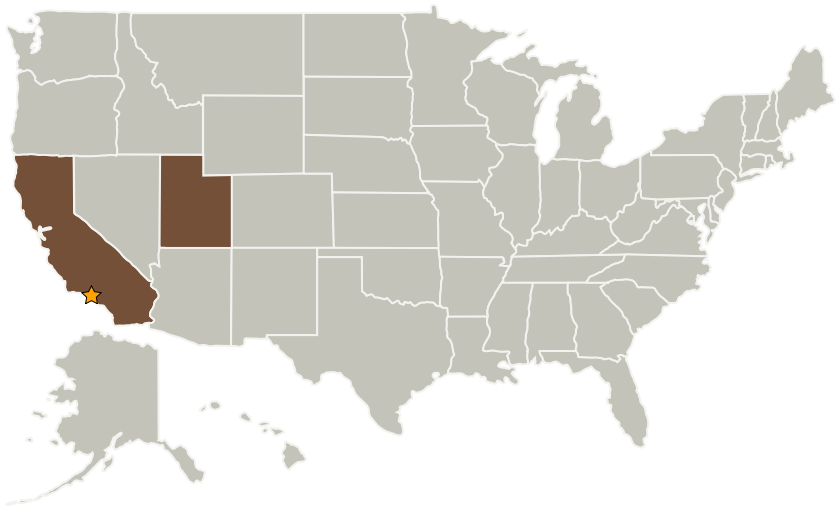
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Jet Propulsion Laboratory(JPL)	Lead Organization	NASA Center	Pasadena, California
Felix ALBA Consultants, Inc.	Supporting Organization	Industry	Murray, Utah

Primary U.S. Work Locations	
California	Utah

Project Management

Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Project Manager:
Celestino Jun Rosca

Principal Investigator:
Felix Alba

Technology Areas

Primary:

- TX07 Exploration Destination Systems
  - TX07.2 Mission Infrastructure, Sustainability, and Supportability
    - TX07.2.5 Particulate Contamination Prevention and Mitigation